SCREENING FUNGICIDES FOR WHITE PINE BLISTER RUST CONTROL

Michael Irvine*[1], Pengxin Lu[2], Douglas G. Pitt[3], Richard Wilson[1]

[1]Ontario Ministry of Natural Resources, Forest Management Branch, 70 Foster Drive, Suite 400, Sault Ste. Marie, Ontario, Canada. P6A 6V5. 705-945-5724. michael.irvine@mnr.gov.on.ca
[2]Ontario Ministry of Natural Resources, Ontario Forest Research Institute
[3]Canadian Forest Service, Great Lakes Forestry Centre
*Corresponding author.

INTRODUCTION

Eastern white pine (*Pinus strobus* L.), one of Ontario's most valuable conifer species, is very susceptible to white pine blister rust caused by *Cronartium ribicola* J.C. Fisch. in Rabenh. Infection causes weeping cankers on branches and main stems and is usually fatal in juvenile white pine. Infection rates vary with local environmental conditions, but can be as high as 90% in some areas. White pine has no natural resistance to this disease.

Bayleton (triadimefon) is a fungicide registered for controlling rusts, including *Cronartium* species, on pine seedlings in the U.S. Johnson *et al.* (1992) found that Bayleton successfully controlled blister rust on sugar pine seedlings, a species closely related to white pine. Berube (1996) also found Bayleton to be highly effective in controlling blister rust infections on white pine in forest nurseries. Because Bayleton is no longer registered for anything in Canada, we want to find a currently or soon-to-be registered fungicide that has activity against white pine blister rust.

MINOR USE PESTICIDE REGISTRATIONS

Minor uses are defined as those for which the projected pesticide product sales are so small that the registrants cannot justify the costs of developing the data required for registration. Health Canada, through the Pest Management Regulatory Agency, has two programs to facilitate the registration of minor use pesticides.

The User Requested Minor Use Label Expansion (URMULE) program considers expanding the label of products for which both the active ingredient, and the end-use product, are registered in Canada.

The User Requested Minor Use Registration (URMUR) allows for recently registered products from other OECD countries to be registered in Canada for a minor use. This program has greater information requirements and so registrations under this program are more complicated and require more commitment from the registrant and sponsor than those under the URMULE program.

Under current silviculture practices, a fungicide to control white pine blister rust would be applied only to newly planted seedlings, and perhaps in nurseries, Christmas tree plantations and

seed orchards. This tiny proposed use meets the minor use definition; it would never be sufficient to interest the registrants of the fungicides proposed below.

TEST FUNGICIDES

For this project we will screen fungicides:

- with systemic activity
- that are formulated to be applied to foliage
- that have proven activity against the basidiomycetes
- that are (or will soon be) registered for something in Canada
- that are registered for conifers (or at least some other woody species) somewhere

The fungicides we will be screening fall into two distinct chemical groups, the dimethylation (ergosterol biosynthesis) inhibitors and the strobilurins. We will test three dimethylation inhibitors from the triazole family (chemically related to trademifon). The dimethylation inhibitor fungicides have a broad spectrum of activity, and are active against most classes of fungi, including the basidiomycetes, but excluding the oomycetes. They have a single site of action; resistance has been documented in some crops. From this group we will test propiconazole (Topas) from Syngenta; myclobutanil (Nova) from Dow and tebuconazole (Folicur) from Bayer.

The strobilurons are variations on strobilurin A, an antifungal compound isolated from cultures of *Strobilurus tenacellus*, a basidiomycete that grows on pine cones. From this group of fungicides we will test azoxystrobin (Quadris) from Syngenta and pyraclostrobin (Headline) from BASF.

Against these we will compare triadimefon (Bayleton) as the published (but unregistered) standard, and a water-treated control.

METHODS

We will test the fungicides listed above at 50% of the label rate for other conifers, and at 100% and 200% of that rate. Following application, we will observe the seedlings for a few weeks post-application for evidence of phytotoxicity. After fungicide application in late summer, the seedlings will be artificially inoculated with blister rust.

Artificial inoculation, following the methods of Zambino (2000) will be used to ensure that all treated seedlings are challenged by *Cronartium ribicola*. The *C. ribicola* basidiospores will be produced on *Ribes* leaves. Ribes leaves are inoculated with aeciospores in a water suspension, and several cycles of production of urediospores and re-infection of *Ribes* leaves follow. Under favorable temperature and moisture conditions, teliospores will form and germinate to produce basidiospores to infect the pine needles.

It is critical that the basidiospores be distributed and germinate evenly on the pine needles. To do this, we will collect *Ribes* leaves that bear well-developed teliospores and put them evenly on a

wired framework. We will then put moistened white pine seedlings underneath and wrap everything with a dark tarp. Temperature in the inoculation chamber is controlled between 5-20 °C with 100% relative humidity. Within 48 h, about 5000 basidiospores cm^{-2} are expected to fall on the seedlings. The *Ribes* leaves are then removed and the seedlings are inoculated under these conditions for another 3 d for basidiospore germination and infection.

The inoculated pine seedlings will then be returned to a greenhouse, and at end of season moved to outdoor holding areas to overwinter. In spring, after the seedlings have broken dormancy, they will be incubated with 80% relative humidity for the disease to develop. Within 4-6 weeks, we expect to be able to evaluate the level of blister rust infection on the seedlings.

TAKE-HOME POINTS

- No fungicides are registered in Canada for the control of white pine blister rust.
- There are some fungicides currently registered for other crops that may work.
- There are programs that allow for expanding the label of currently registered products to minor crops such as white pine.

REFERENCES

Berube, J.A. 1996. Use of triadimefon to control white pine blister rust. Forestry Chronicle, 72: 637-638.

Johnson, D.R., B.B. Kinloch, and A.H. McCain. 1992. Triademefon controls white pine blister rust on sugar pine in a greenhouse test. Tree Planter's Notes: 43: 7-10.

Zambino, P.J. 2000. Evaluating white pine blister rust resistance in *Ribes* after artificial inoculation. HortTechnology: 10: 544-545.

NOTES